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Legato NetWorker®

Module for DB2® Universal Database™

Release 1.5

Linux®, UNIX® Windows NT®, and Windows® 2000 Version

Administrator's Guide

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Legato NetWorker Module for DB2 Universal Database Administrator's Guide, Release 1.5, Linux, UNIX and Windows Version

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Contents

Preface

The *Legato NetWorker Module for DB2 Universal Database Administrator's Guide* contains information about how to configure and manage the Legato NetWorker Module software.

You *must* install the NetWorker software on your clients to use the information presented in this guide. If you have not yet installed the software, refer to the *Legato NetWorker Installation Guide* for installation instructions.

Audience

The information in this guide is intended for system administrators who are responsible for installing software and maintaining the servers and clients on a network. Operators who monitor the daily backups may also find this manual useful.

Product Documentation

Legato offers an extensive archive of product documentation at its web site *www.legato.com*. Most of the documents are in Adobe® Acrobat® Portable Document Format (PDF), and can be viewed by downloading and installing the Adobe Acrobat Reader. The Reader is available in the */viewers/acroread* directory on the Legato Documentation Suite CD-ROM, or directly from Adobe at *www.adobe.com*. To install and use the Reader on the platform of your choice, refer to the instructions in the CD-ROM's */viewers/acroread/readme.txt* file or at the Adobe web site.

Conventions

This document uses the following typographic conventions and symbols to make information easier to access and understand.

Convention	Indicates	Example
boldface	Names of DOS or UNIX line commands, daemons, options, programs, or scripts	The **nsradmin** command starts the command line version of the administration program.
italic in text	Pathnames, filenames, computer names, new terms defined in the Glossary or within the chapter, or emphasized words	Displayed messages are also written to */nsr/logs/daemon.log*.
italic in command line	A variable that you need to provide in the command line	**`nwadmin -s`** *server-name*
`fixed-width`	Examples and information displayed on the screen	`media waiting: recover waiting for 8mm 5GB tape volume name`
`fixed-width, boldface`	Commands and options that you must type exactly as shown	**`nsr_shutdown -a`**
Menu_Name> Command	A path or an order to follow for making selections in the GUI	Volume>Change Mode>Appendable
Important:	Information that you must read and follow to ensure successful backup and recovery of your data	 **Important:** You must install the NetWorker Module software in the same directory where you installed the NetWorker client binaries.

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Chapter 1: Introduction

Legato NetWorker® Module for DB2® Universal Database™ provides a backup and restore solution for the IBM® DB2 Universal Database.

This chapter introduces:

Legato NetWorker Software

The NetWorker product is a network data storage management solution that protects and helps manage data across an entire network. NetWorker software simplifies the storage management process and reduces the administrative burden by automating and centralizing data storage.

With NetWorker software, you can:

- Perform automated backups.
- Administer, configure, monitor, and control NetWorker functions from any system on a network.

- Cross-platform support of enterprise applications running on Linux®, UNIX® and Windows® platforms.
- Centralize and automate data management tasks.
- Optimize performance using parallel save streams to a single device, or to multiple devices or storage nodes.

NetWorker client/server technology uses the network protocol Remote Procedure Call (RPC) to back up data. The NetWorker server software consists of several server-side services and programs that oversee backup and restore processes. The NetWorker client software consists of client-side services and user interface programs.

The server-side services and programs perform the following functions:

- Oversee backup and restore processes
- Maintain client configuration files
- Maintain an online client index
- Maintain an online media database

During a backup, the NetWorker server makes an entry in an online client file index and records the location of the data in an online media database. These entries provide restore information needed for every database that is backed up. The client index entry is maintained in the index until the browse policy configured for the client's save set has been exceeded.

When the retention policy configured for the client's save set is exceeded, the save set changes status from "recoverable" to "recyclable" in the media database. When all the save sets on the storage media change status to "recyclable," the media mode changes status to "recyclable," and the media is eligible for automatic relabeling. The save set entries, however, remain in the media database until the media is actually relabeled. Data is still recoverable, using the NetWorker **scanner** command until the media is relabeled.

After a scheduled backup, NetWorker sends a record of the server's *bootstrap* file to the default printer. This is a printed record of the dates, locations, and save set ID numbers for the server's online indexes, required for restoring data. Keep the bootstrap printout on file as a quick reference in the event of a disaster, such as a disk crash or server malfunction.

Software Features

NetWorker Module enhances NetWorker software and provides the following:

- Automated backup media management.
- Manual and scheduled DB2 Universal Database backups.
- The capability to restore DB2 Universal Database; database or tablespace.
- The ability to integrate both database and file system backups.
- Storage management through automated scheduling, autochanger support, electronic tape labeling, and tracking.
- Support for a backup to a centralized backup server.
- High performance through support for multiple, concurrent high-speed devices, such as DLT drives.
- Reliable, high-performance data protection for DB2 Universal Database Server databases.
- Integrated backup and restore procedures for DB2 Universal Database.
- Network-wide data protection solutions.
- DB2 Universal Database Enterprise Extended Edition (EEE) support.
- Multiple session backup support.
- Secure restore of data to alternate database instances (on original machine or different one.)
- Full browse and retention policy support.
- Full incremental and delta backup support.

1

NetWorker Module Utilities

This section describes how NetWorker Module interacts with the DB2 Universal Database Backup and Restore Utility to back up and restore database data.

This section discusses the following topics:

NetWorker Module Backup

NetWorker Module connects the DB2 Universal Database backup utility to the NetWorker server. This is accomplished through the NetWorker **libnsrdb2** library that implements an XBSA API (Application Programming Interface.)

When a backup request is initiated, the DB2 Backup utility interacts with NetWorker software through the XBSA API to coordinate a backup of the database.

When a scheduled backup is triggered by **nsrd** on the NetWorker server, **savegrp** executes the **nsrdb2** script instead of performing the standard save. The **nsrdb2** script prepares the environment and runs the **nsrdb2sv** binary. The **nsrdb2sv** binary invokes DB2 Backup to perform a database backup.

NetWorker Module Restore

When a DB2 Universal Database manager restore request is initiated, the NetWorker Module XBSA library translates the object names requested by the database into a format understood by the NetWorker software and forwards it to the **nsrd** service on the NetWorker server. The media service, **nsrmmd**, searches the NetWorker server online media database for the media containing the objects requested and restores the data to the database manager.

db2uext2 and Log Files

A transactional Log Backup and Restore is performed using the **db2uext2** program provided with NetWorker Module. The DB2 Universal Database must be configured for roll-forward recovery by enabling the *USEREXIT* database configuration parameter.

The database manager:

- Calls **db2uext2** to back up online logs to disk drive or NetWorker server.
- Requests **db2uext2** to restore logs during a database roll-forward.

You can *also* use the **db2 archive log** command to call **db2uext2** to archive logs on demand.

Important: *Only* the **db2uext2** program supplied with NetWorker Module is supported.

DB2 Backup and Restore Utility Features

DB2 Backup and Restore is a utility included with DB2 Universal Database that provides:

- Online or offline concurrent backups of databases and tablespaces.
- Offline recovery of databases.
- Online or offline recovey of tablespaces.
- Automated backup and restore of transactional logs.
- Multiple session support allows you to backup and restore several streams of data.
- On demand log archiving.

  DB2 version 7.2 allows you to close and, if the *USEREXIT* option is enabled, archive the active log of a recoverable database whenever you want. This is done using the **db2 archive log** command.

1

Chapter 2: Basic Configuration

This chapter describes how to configure the NetWorker Module software. This chapter discusses the following topics:

Configuration Requirements

With a single license, NetWorker Module software supports the concurrent backup of DB2 databases on separate computers to the same NetWorker server.

The software must be installed:

- On the same computer as the DB2 Universal Database manager.
- Once per computer, regardless of the number of databases to be backed up.

  For detailed installation instructions, refer to the *Legato NetWorker Module for DB2 Universal Database Installation Guide*.

All data can be backed up locally or remotely to the same NetWorker server.

NetWorker Module supports the concurrent backup of DB2 databases on separate computers to the same NetWorker server using multiple licenses.

NetWorker Module should be installed only once per computer, regardless of the number of databases to be backed up. All databases can be backed up locally or remotely to the same NetWorker server.

The NetWorker server can be located on any of the computers containing the database, or on a separate Windows or UNIX system.

Configuring NetWorker Module

Before performing basic DB2 Universal Database and NetWorker configuration procedures, make sure that you have installed NetWorker Module using the instructions in the *Legato NetWorker Module for DB2 Universal Database Installation Guide*.

To complete the basic database and NetWorker Module configuration, perform the following:

- "Task 1: Configure the DB2 Universal Database Instance" on page 20.
- "Task 2: Create a Client Resource" on page 22.
- "Task 3: Configure Volume Pools" on page 26.

You can view and configure NetWorker resources and their attributes using the NetWorker Administrator program.

For additional references about software configuration see, " References for Additional Configuration" on page 27.

Task 1: Configure the DB2 Universal Database Instance

To configure the database instance:

1. Create a vendor configuration file that contains all of the required XBSA environment settings. You can use any name you like for this file.

Important: Only use environment variables that are listed in Appendix A. Use of any other NetWorker environment variables may result in unpredictable behavior.

   a. Make sure that the file has the following structure, with the environment variable name followed by an equal sign (=) and then the variable setting value. For example:

      Environment_Variable=Setting

      Note: Make sure that you follow the correct syntax in the vendor configuration file, or it will not run correctly.

   b. Make sure that the file contains at least the *NSR_SERVER* environment variable, that must be set to the name of the NetWorker server used to backup the database client.

The following is an example of a vendor configuration file:

```
NSR_SERVER=oka.legato.com
NSR_LIBNSRDB2_DEBUG_FILE=e:\nmdb2.log
NSR_NO_BUSY_ERRORS=TRUE
NSR_DATA_VOLUME_POOL=DB2Data
NSR_LOG_VOLUME_POOL=DB2Logs
```

Important: The vendor configuration file is read at the database manager start time. The database engine must be stopped and restarted if any changes are made to the file.

c. Set the *DB2_VENDOR_INI* registry variable to point to the absolute pathname of the configuration file. For example:

- On UNIX:

  $ **db2set DB2_VENDOR_INI=/home/***db2inst1***/config**

- On Windows:

  %SystemDrive% **db2set DB2_VENDOR_INI=e:\config**

For more information about XBSA environment variables refer to "Appendix A: XBSA Environment Variables" on page 61.

2. Restart the database instance.

For information about database registry variables and the vendor configuration file, refer to the *DB2 Universal Database Administrator's Guide*.

Task 2: Create a Client Resource

Before a client can be backed up by a NetWorker server, the client computer must have the appropriate NetWorker client software installed. For details about installing NetWorker Client, refer to the *Legato NetWorker Installation Guide* appropriate for your platform.

You can use the following procedures to create a Client resource for the DB2 Universal Database computer:

- "How to Create a Client Resource on UNIX" on page 22.
- "How to Create a Client Resource on Windows" on page 23.
- "How to Create a Client Resource for a Scheduled Backup" on page 24

Important: You can only use NetWorker Module with NetWorker to perform backups if there is a Client resource correctly configured for the database host computer.

For more information about the different attributes of a Client resource and how to create a NetWorker Client resource, refer to the NetWorker online help and the *Legato NetWorker Administrator's Guide*.

How to Create a Client Resource on UNIX

To create a Client resource:

1. Display the NetWorker Administrator's program and select Client Setup from the Clients menu.
2. If the hostname of the database client does *not* appear in the Clients window, create a Client resource for the database client.

   If the hostname of the client *does* appear in the Clients window, proceed to step 6.
3. Click Create and enter the hostname of the database computer in the Name field.
4. Select a value for the Browse policy.

   If you do not select a value for the Browse policy, the NetWorker server uses the default value of one month. The Browse policy cannot exceed the Retention policy.
5. Select a value for the Retention policy.

If you do *not* select a value for the Retention policy, the NetWorker server uses the default value of one year. The Retention policy must be greater than or equal to the Browse policy.

Important: To restore backups from one database computer to another, you must add the fully qualified host name of that computer to the Remote Access field in the Client resource.

Note: When you enter database instances in the Application Information field, ensure that you *always* insert a colon after the last instance.

6. Add the name of one or more database instances that require restore permission on the same or different host in the Application Information field. The command **DB2_R=***SAMPLE:db2inst1:db2inst2:* allows the instances *db2inst1* and *db2inst2* restore the database *SAMPLE*.

   Instances are always separated by a colon after the database name.

7. Add another line in the Application Information field for any other databases that you want to add to a Client resource. For example:

   DB2_R=*SAMPLE:db2inst1:db2inst2:*

   DB2_R=*TEST:db2inst3:db2inst4:*

   Note: When you enter database instances in the Application Information field, ensure that you *always* insert a colon after the last instance.

8. Click Apply in the Clients window.
9. From the File menu, select exit.

How to Create a Client Resource on Windows

To create a client resource:

1. Display the NetWorker Administrator's program and click the Configure tab in the servers window.
2. Click Manage Clients to open the Clients window and create a new Client resource for the database client if the hostname of the client does *not* appear in the Edit Client dialog box.

   Proceed to step 7 if the hostname of the client *does* appear in the Edit Client dialog box.

3. Right-click the main Clients icon and select Create.

4. Enter the hostname of the database computer in the Name text box.
5. Select a value from the Browse policy drop-down list.

   Note: If you do *not* select a value for the Browse policy, the NetWorker server uses the default value of one month. The Browse policy cannot exceed the Retention policy.
6. Select a value from the Retention policy drop-down list.

   If you do *not* select a value for the Retention policy, the NetWorker server uses the default value of one year. The Retention policy must be greater than or equal to the Browse policy.

Important: To restore backups of a database computer to a different computer, add the fully qualified host name of the computer to the *Remote Access* field in the Client resource.

7. Add the name of one or more database instances that require restore permission on the same or different host in the Application Information field. The command **DB2_R=***SAMPLE:db2inst1:db2inst2:* allows the instances *db2inst1*and *db2inst2* restore the database *SAMPLE*.

   Instances are always separated by a colon after the database name.
8. Add another line in the Application Information field for any other databases that you want to add to a Client resource. For example:

   DB2_R=*SAMPLE:db2inst1:db2inst2:*

   DB2_R=*TEST:db2inst3:db2inst4:*
9. From the File menu, select exit.

How to Create a Client Resource for a Scheduled Backup

To complete the client resource configuration for scheduled backups:

1. Log on to the computer as root on UNIX or administrator on Windows.
2. Display the NetWorker Administrator program and open the Clients window.
3. Select the Client resource for the database instance.

4. Enter the databases and tablespaces that you want to back up in the *Save set* list.

   Note: The save set name is case sensitive.

   The save set name that is created in the media database is created in the XBSA library with arguments passed from the DB2 Universal Database manager in the following way:

   DB2:/database_name/node_number

   If you enter *DB2:/SAMPLE* in the Client resource saveset list, the save set name created in the media database will be:

   DB2:/SAMPLE/NODE0000

5. Specify any databases that belong to the same DB2 Universal Database instance.

   - To specify multiple databases, place each name on a separate line.
   - To back up the tablespaces of a database, place them all on the same line after the database name separated by a slash. For example:

     /SAMPLE/USERSPACE1/USERSPACE2

6. Select a NetWorker group. For details about NetWorker backup groups, see "How to Configure a Backup Group" on page 46.
7. Enter the name of the customized **nsrdb2** script in the Backup command field.
8. For windows add the database instance user name in the *Remote user* field and it's password in the *password* field.

Important: Each database instance requires a separate Client resource because the *Backup command* field of the Client resource can only have one **nsrdb2** script name and the *DB2_INSTANCE* variable is mandatory for each **nsrdb2** script.

If multiple save set names are specified in the *Save set* list of the Client resource and the **nsrdb2** script has a well-defined *PRECMD* and/or *POSTCMD* variable, the pre-command and post-command files will be:

- Common for all the backups
- Executed once for each backup

For more information about configuring a NetWorker client for scheduled backups, refer to the *Legato NetWorker Administrator's Guide*.

Task 3: Configure Volume Pools

The following section describes how to use pool and volume resources to optimize backup and restore performance:

- "How to Specify Pools" on page 26.
- "How to Set the NSR_DATA_VOLUME_POOL Variable" on page 27.
- "How to Set the NSR_LOG_VOLUME_POOL Variable" on page 27

For more information about volume pools, label templates and their configuration procedures, refer to the *Legato NetWorker Administrator's Guide* appropriate for your platform.

How to Specify Pools

When a backup occurs, the software tries to match the characteristics of the data to the attributes configured for a Pool resource. If the data matches the criteria of a pool configuration, NetWorker software directs the data to a labeled volume belonging to that pool.

Volume pools provide the ability to segregate data such as table spaces and archived logs onto different sets of media. Pools allow you to direct backup data to specific devices.

Each volume pool has a *Pool type* attribute. For NetWorker Module, the only valid pool types are:

- *Backup*
- *Backup clone*

The choices that you select in the pool configuration to sort backup data to specific volumes labeled for the pool are used. You can sort backup data by pool type and any combination of these criteria:

- Backup group
- NetWorker client

You might want to organize backup data in different ways:

- Department
- Type of database

You can send your backup data to separate media by setting up volume pools for those backups.

How to Set the NSR_DATA_VOLUME_POOL Variable

To specify that the NetWorker server backup the data to a pool *other* than the Default pool, set the *NSR_DATA_VOLUME_POOL* environment variable to the volume pool name in the vendor configuration file. For details about how to use the DB2 Universal Database vendor configuration file, see "Task 1: Configure the DB2 Universal Database Instance" on page 20.

The *NSR_DATA_VOLUME_POOL* environment variable is used for database and table space backup. This applies to manual, scheduled or table space backup.

How to Set the NSR_LOG_VOLUME_POOL Variable

To specify that the NetWorker server back up logs to a pool *other than the Default pool*, set the *NSR_LOG_VOLUME_POOL* environment variable to the volume pool name in the vendor configuration file. This environment variable applies to transactional log backup.

For details about how to use the DB2 Universal Database vendor configuration file, see "Task 1: Configure the DB2 Universal Database Instance" on page 20.

References for Additional Configuration

Refer to the *Legato NetWorker Administrator's Guide* and the Legato NetWorker online help for detailed information about the following topics:

- Enabling regular filesystem backups
- Configuring the Server resource
- Configuring the Client resource
- Configuring Device resource
- Labeling and mounting volumes
- Configuring storage nodes

Refer to the Legato Compatibility Guides for a complete list of the storage devices that NetWorker currently supports. The Legato Compatibility Guides are available from the Legato web site at *www.legato.com*.

2

Chapter 3: Manual Backups

This chapter describes how to configure and run manual DB2 Universal Database backups.

Topics covered in this chapter:

Important: To prepare for disaster recovery, you must perform regular manual backups of the NetWorker server bootstrap. The NetWorker server bootstrap and client indexes are *not* automatically backed up at the end of a manual backup. For more information about NetWorker bootstrap backups, refer to the *Legato NetWorker Administrator's Guide* appropriate for your platform and the *Legato NetWorker Disaster Recovery Guide*.

To keep track of the status of your manual backups, use the information in "Monitoring Manual Backups" on page 35 .

Running Manual Backups

Important: Before running manual backups, make sure that you have configured the NetWorker Server, Client, Device, and Pool resources. Backup volumes should be labeled and mounted. For more information see, "Configuring NetWorker Module" on page 20.

After you have installed and configured NetWorker Module, you can run manual backups.

To complete a manual backup:

1. Make sure that you have created the vendor configuration file. For details see, " Task 1: Configure the DB2 Universal Database Instance" on page 20.
2. Make sure that you have configured a Client resource. For details, see "Task 2: Create a Client Resource" on page 22.
3. Use the **load libnsrdb2** option with the **db2 backup** command to direct the backup of the database *SAMPLE* to a NetWorker server. For example:

   $ **db2 backup db** *SAMPLE* **LOAD /usr/lib/libnsrdb2.***

   Table 1 lists the path and the suffix information for the **load libnsrdb2** command.

Table 1. Path and Suffix for load libnsrdb2.* (Part 1 of 2)

Operating System	Path with Suffix
AIX	**/usr/lib/libnsrdb2.a**
HP-UX	**/usr/lib/libnsrdb2.sl**
Linux	**/usr/lib/libnsrdb2.so**

Table 1. Path and Suffix for load libnsrdb2.* (Part 2 of 2)

Operating System	Path with Suffix
Solaris	**/usr/lib/libnsrdb2.so**
Windows NT and Windows 2000	• NetWorker release 5.5.x and earlier: **<drive>:\win32app\nsr\bin\libnsrdb2.dll** • NetWorker release 5.7 and later: **<drive>:\Program Files\nsr\bin\libnsrdb2.dll**

How to Back Up Log Files

Log files are *not* backed up by default.

To automatically backup online archived logs as they become filled configure the database for roll-forward recovery by enabling the *USEREXIT* configuration parameter. If the *USEREXIT* parameter is enabled the database engine will call the **db2uext2** program. For example:

```
$ db2 update db cfg for SAMPLE using USEREXIT on
```

For detailed information about log backup and restore, see "db2uext2 and Log Files" on page 17.

Using Multiple Session Backup

NetWorker Module 1.5 supports the use of multiple sessions for the backup of DB2 Universal Database. Multiple sessions are one or more streams of data that can be extracted, in parallel, from a database, and written in parallel to multiple media devices. With NetWorker Module, multiple sessions can enhance performance significantly when a large amount of data is backed up and restored using multiple tape drives. The number of sessions to be used is specified by the *OPEN num-sess SESSIONS* parameter of the database back up command.

How to Configure a Multiple Session Backup

Before starting a multiple session backup:

1. Start the NetWorker Administrator program.

Important: Before you start a multiple session backup, ensure that the number of devices is the same as the number of sessions specified in the backup command. Target sessions for each device must be set to a value of 1 for optimal restore performance.

2. Set the server parallelism:
   a. Select Server> Server Setup from the main menu.
   b. Set the Parallelism attribute to at least one more than the number of sessions you will be using during a backup. For example, if you are using three sessions, specify a value of 4 or greater for the parallelism.
3. Set the client parallelism:
   a. Select Client> Client Setup from the main menu.
   b. Set the Parallelism attribute to the same or more than the number of sessions you will be using during a backup. For example, if you are using three sessions, specify a value of 3 or greater for the parallelism.
4. Set the device target sessions:

   Select Media>Devices and set Target Sessions to 1 per device.

   This will improve performance by eliminating interleaving.

How to Improve Performance for Multiple Session Backup and Restore

To improve multiple session backup and restore performance:

1. Start the NetWorker Administrator program.
2. Specify a separate backup device for each session in the backup operation.

   Consider using a different NetWorker server for backup operations not associated with the database server. You can dedicate a storage node exclusively for your multiple session backups.

   For optimum performance, ensure that the same number of devices are available at restore time as were used during the backup. Use the **nsrinfo** command to find the number of sessions that were run during the backup:

   # **nsrinfo -s** *server* **-n** *database* **-X all** *clientname* **|grep** *db_name*

   The following is sample output from the **nsrinfo** command:

   ```
   # nsrinfo -s tundro.legato.com -n db2 -X all \
   tundro.legato.com | grep DEMODB

   version=1, objectowner= DB2, objectname=/DEMODB/NODE0001
   /FULL_BACKUP.20011017164756.1, createtime=Wed Oct 17
   16:47:56 2001, copytype=BSACopyType_BACKUP, copyId=10033

   51676.1003351677, restoreOrder=1003351676.1,lgname=,
   copygpname=, objectsize=0.0, resourcetype=database,
   objecttype=BSAObjectType_FILE,

   objectstatus=BSAObjectStatus_

   ACTIVE, description=DB2 Backup, objectinfo=db2inst1:1
   ```

   Note: The *objectinfo=db2inst1:1* output is the information that is required to proceed with the multiple session restore. *db2inst1:* is the instance that did the backup and 1 is the number of sessions that were used for the backup.

How to Prevent a Backup from Hanging

To prevent a backup from hanging, set the XBSA *NSR_NO_BUSY_ERRORS* environment variable to *TRUE* in the vendor configuration file:

NSR_NO_BUSY_ERRORS=TRUE

If the NetWorker server is temporarily unavailable when you start a backup, the backup waits until the NetWorker server becomes available if this parameter is not set to true.

For more information about the *NSR_NO_BUSY_ERRORS* environment variable, see "Appendix A: XBSA Environment Variables" on page 61.

Note: If the *NSR_NO_BUSY_ERRORS* environment variable is set to true and the back up hangs, check to see if **nsrexecd** is running:

```
# ps -ef | grep nsrexecd
```

If **nsrexecd** is not running, start it.

```
# nsrexecd
```

How to Remove Failed Backups

If a backup fails, you might want to remove it manually from the NetWorker server's media database. Restore of failed backups will result in error.

To manually remove a failed backup:

1. Use the **mminfo** command on the NetWorker server to see if the record for the failed backup is in the media database. For example:

   $ mminfo -v -c *servername.legato.com*

   servername.legato.com is the hostname of the computer that the database resides on.

2. Use the output of the **mminfo** command to see if a saveset was created for a failed backup and note the saveset id (ssid).Use the **nsrmm** command to remove the saveset from the media database. For example:

   $ nsrmm -S ssid -d

   The *ssid* environment variable is the saveset from the output of the **mminfo** command.

Monitoring Manual Backups

Use the NetWorker Administrator program to monitor the status of backup and recovery operations. Progress and completion messages are displayed when a backup or recover is finished. Status information about a backup or recover operation is displayed if either one does not proceed.

For more information about viewing messages using the NetWorker Administrator program, refer to the *Legato NetWorker Administrator's Guide*.

Diagnostic and Error Messages

Diagnostic messages specific to NetWorker Module are recorded in the following log files:

- On UNIX:
  $INSTHOME/sqllib/log/nsrdebug.log
- On Windows:
  %INSTHOME%\sqllib\logging\nsrdebug.log

How to Configure Error and Diagnostic Messages

You can specify that the NetWorker Module error and diagnostic messages are written to different files and you can control the level of detail reported by setting the *NSR_LIBNSRDB2_DEBUG_FILE*, *NSR_DEBUG_LEVEL*, *NSR_DEBUG_FILE* and *NSR_DB2UEXT2_DEBUG_FILE* environment variables in the vendor configuration file.

The **db2uext2** program provided with NetWorker Module writes debugging information to the specified file.

Set the following environment variables :

- *NSR_LIBNSRDB2_DEBUG_FILE* to a valid file pathname.
- *NSR_DEBUG_LEVEL* to an integer in the range of 0 to 9, 9 is the highest level of detail and 0 is the lowest.
- *NSR_DEBUG_FILE* to the full pathname and filename to which XBSA messages should be written.
- *NSR_DB2UEXT2_DEBUG_FILE* to the full pathname of a log file to which diagnostic and error messages specific to DB2 Universal Database transactional log backup and restore should be written.

For more information about environment variables, see "Appendix A: XBSA Environment Variables" on page 61.

Chapter 4: Scheduled Backups

This chapter describes how to set up and run scheduled DB2 Universal Database backups using NetWorker Module for DB2 Universal Database. It outlines the procedures for testing and monitoring scheduled backups using the NetWorker Administrator program and specific log files.

Important: Before you configure and run a scheduled backup, make sure that you run a manual backup to verify your configuration. For instructions about running a manual backup, refer to "Chapter 3: Manual Backups" on page 29.

This chapter contains the following sections:

NetWorker can be configured to run DB2 Backup on a regular basis by setting up a backup schedule.

NetWorker Module backs up your host according to the NetWorker schedule you configure.

Scheduling DB2 Universal Database Backups

Before running scheduled backups, make sure that you have configured the NetWorker Server, Client, Device, and Pool resources. Backup volumes should be labeled and mounted. For more information see, "Configuring NetWorker Module" on page 20.

To configure scheduled backups:

- "Task 1: Set XBSA Environment Variables" on page 38
- "Task 2: Customize the nsrdb2 Script" on page 39
- "Task 3: Configure a Backup Schedule" on page 45
- "Task 4: Back Up Databases and Tablespaces"
- "Task 5: Test Scheduled Backup Configuration" on page 48

You can use the information in "Monitoring Scheduled Backups" on page 50 to keep track of the status of your scheduled backups.

Task 1: Set XBSA Environment Variables

Make sure that you have created the vendor configuration file before scheduling a backup. For details see, " Task 1: Configure the DB2 Universal Database Instance" on page 20.

Important: The *NSR_SERVER* variable must be set to the NetWorker server that is performing the scheduled backup. If the NetWorker server doing the scheduled backup and the NetWorker server specified by the *NSR_SERVER* variable do not coincide, the scheduled backup will fail.

For more information about XBSA environment variables refer to "Appendix A: XBSA Environment Variables" on page 61.

Task 2: Customize the nsrdb2 Script

To customize the **nsrdb2** script:

1. Copy the **nsrdb2** script to the directory where **nsrdb2sv** is located. For example:
   - On UNIX it is found in the following location:
     /etc/nsrdb2.sh
   - On Windows it is found in the following location. For example:
     c:\Program Files\nsr\bin\nsrdb2.bat
2. Give your script a unique name, starting with *nsr* or *save.*
   - On UNIX, the **nsrdb2** script must be executable If required, add executable permissions to the file using the **chmod** command. For example:

     ```
     # chmod +x filename
     ```

   Table 2 lists the path and the suffix information for the **load libnsrdb2** command.

Table 2. Path and Suffix for load libnsrdb2.*

Operating System	Path with Suffix
AIX	**/usr/lib/libnsrdb2.a**
HP-UX	**/usr/lib/libnsrdb2.sl**
Linux	**/usr/lib/libnsrdb2.so**
Solaris	**/usr/lib/libnsrdb2.so**
Windows NT and Windows 2000	• NetWorker release 5.5.x and earlier: **<drive>:\win32app\nsr\bin\libnsrdb2.dll** • NetWorker release 5.7 and later: **<drive>:\Program Files\nsr\bin\libnsrdb2.dll**

3. For each database instance that uses NetWorker Module to back up its data, make at least one customized copy of the **nsrdb2** script.

   You can create multiple versions of the **nsrdb2** script on the same database host.

Environment Variables in the nsrdb2 Script

Use the following environment variables in your copy of the **nsrdb2** script:

DB2INSTANCE

This variable is m*andatory* for each scheduled backup. Set this variable in your copy of the **nsrdb2** script to specify the database instance.

- On UNIX: If the username of your database instance is *db2inst1*, set *DB2INSTANCE* in your copy of the **nsrdb2** script to the following value:
  DB2INSTANCE=db2inst1
- On Windows: If the DB2 Universal Database instance is *DB2*, set *DB2INSTANCE* in your copy of the **nsrdb2.bat** file to the following value:
  DB2INSTANCE=DB2

INSTHOME

This variable is m*andatory* for each scheduled backup. Set this variable to point to the home directory of the DB2 Universal Database instance.

- On UNIX: If the DB2 Universal Database instance home directory is */home/db2inst1*, set *INSTHOME* to the following value:

  INSTHOME=/home/db2inst1
- On Windows: If the database instance home directory is *e:* on Windows NT or Windows 2000, set *INSTHOME* to the following value:

  INSTHOME=e:

PATH

This variable is m*andatory* for each scheduled backup. Set this variable to include the directory containing the **nsrdb2sv** and the **db2** executables.

- On UNIX:

  PATH=/usr/sbin: %INSTHOME%/sqllib/bin
- On Windows:

  PATH=d:\Program Files\nsr\bin; %INSTHOME%\sqllib\bin

NSR_BACKUP_OPT

This optional environment variable can be used to pass additional options to the **nsrdb2sv** program.

On UNIX and Windows: Set *NSR_BACKUP_OPT* to increase the debug level:

NSR_BACKUP_OPT="-D 4"

DB2_BACKUP_OPT

This optional environment variable is used to pass additional options to the DB2 Backup command. For a list of DB2 Backup command options, refer to your DB2 Universal Database *Administrator's Guide: Design and Implementation*.

On UNIX and Windows: To specify the number of buffers, set *DB2_BACKUP_OPT*:

DB2_BACKUP_OPT="WITH 10 BUFFERS"

PRECMD

You can set *PRECMD* to point to a file containing a preprocessing script to be run before the DB2 backup script.

Note: The *PRECMD* script must have the permissions set to allow execution by the root user; scheduled backup is always launched by root. The script will return a zero value when the backup succeeds, and a nonzero value if it fails.

POSTCMD

You can set this variable to point to a file containing a post-processing script to be run after the backup script. If the backup script fails, the failure is reported, and the post-processing script will still be executed. If the post-processing script fails, an error message will be reported.

DB2_ONLINE

This optional environment variable is used to specify that an online DB2 Universal Database backup should be done. The default value is *FALSE*; the backup will be offline if it is not set to *TRUE*.

On UNIX and Windows: To run an online back up, set *DB2_ONLINE* to *TRUE*:

DB2_ONLINE=TRUE

INCREMENTAL

Set this variable to point to schedule incremental backups of your database instance.

If you want to run incremental backups, set *INCREMENTAL* to the following value:

INCREMENTAL=TRUE

DELTA

Set this variable to schedule delta backups of your database instance.

If you want to run delta backups, set *DELTA* to the following value:

DELTA=TRUE

DB2_EEE

Set this variable to enable Enterprise Extended Edition (EEE) backups of your DB2 Universal Database.

On UNIX and Windows: If you want to backup EEE database, set *DB2_EEE* to the following value:

DB2_EEE=TRUE

DB2_ALL_PARAM

DB2_ALL_PARAM is complimentary to *DB2_EEE*, set this variable to enable scheduled backups of EEE.

On UNIX and Windows: If you want to specify which EEE nodes are backed up, set *DB2_ALL_PARAM* to the following value:

DB2_ALL_PARAM="0,1,2,3"

This variable will indicate that the *DB2_EEE* command will be executed on nodes *0,1,2,3* only.

EEE Considerations

Configuring one or more hosts as members of the same NetWorker group for scheduled backups, you can enhance backup performance by backing up all hosts in parallel.

Running EEE backups in offline mode, the second host performing the backup will display the following error message:

```
The database is still in use
```

If you run it in offline mode, set the server or device parallelism to 1.

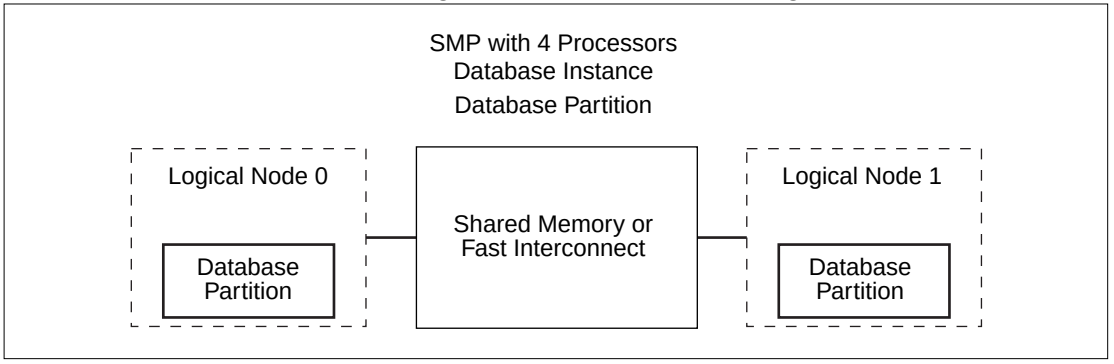
Be sure to run the backup in online mode when EEE is configured as a single

All nodes reside on a single computer with one copy of the operating system running. You only require one copy of the **nsrdb2** script and one client resource for scheduled back up. For example:

Set *DB2_EEE=TRUE* in the **nsrdb2** script.

"Figure 1.DB2 EEE SMP Configuration" Shared Memory Partitions (SMP).

Figure 1. DB2 EEE SMP Configuration

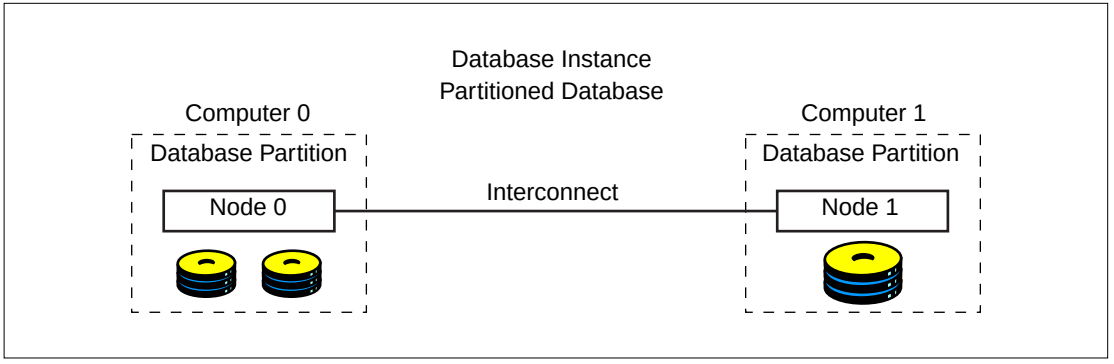


"Figure 2.DB2 EEE SDP Configuration" Single Database Partition (SDP) illustrates two separate computers with a single node on each.

This configuration requires that you create a separate **nsrdb2** script and client resource for each physical computer. For example:

Set *DB2_EEE=TRUE* and *DB2_ALL_PARAM="0"* and Set *DB2_EEE=TRUE* and *DB2_ALL_PARAM="1"* to specify the node for scheduled backup.

Figure 2. DB2 EEE SDP Configuration



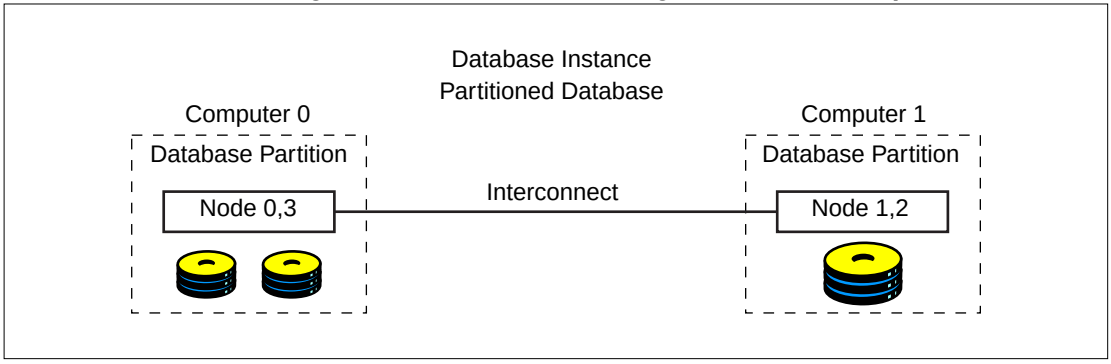
Important: All EEE clients should be members of the same backup group.

"Figure 3.DB2 EEE SDP Configuration with Multiple Nodes" Single Database Partition (SDP) illustrates two separate computers with multiple nodes.

This configuration requires that you create a separate **nsrdb2** script and client resource for each physical computer. For example:

Set *DB2_EEE=TRUE* and *DB2_ALL_PARAM="0,3"* and Set *DB2_EEE=TRUE* and *DB2_ALL_PARAM="1,2"* to specify the nodes for scheduled backup.

Figure 3. DB2 EEE SDP Configuration with Multiple Nodes



Task 3: Configure a Backup Schedule

The NetWorker Administrator program provides a calendar for configuring the Schedule resource. You can specify the days of the week to run a scheduled backup.

There are several preconfigured schedules or you can create and modify your own schedules. For details about how to do this, refer to the *Legato NetWorker Administrator's Guide* appropriate for your platform.

Important: NetWorker Module does *not* currently support the use of the Stop button in the NetWorker Administrator program to stop scheduled backups. Use of the Stop button to cancel the scheduled backup creates an incomplete backup record in the media database. The backup will continue until it is finished.

To configure a scheduled backup follow these procedures:

- "How to Configure a Backup Schedule" on page 46
- "How to Configure a Backup Group" on page 46

How to Configure a Backup Schedule

To customize a NetWorker Schedule resource for your DB2 Universal Database backup:

1. In the Schedule resource, select a level for each day of the week.
   - Level *full* specifies that the backup will run on that day.
   - Level *skip* specifies that the backup will not run on that day.
2. Enter the name of the NetWorker schedule in the *Schedule* field of the Client resource.

How to Configure a Backup Group

A NetWorker backup group is a set of NetWorker Client resources that start backing up data at a specified time when the Autostart feature in the group resource is enabled. You can assign one or more Client resources configured for the DB2 Universal Database host(s) to a backup group.

There is a preconfigured backup group named Default with the following settings:

- Autostart = Disabled
- Start time = 3:33
- Client retries = 1
- Clones = No
- Clone pool = Default Clone

You can create other backup groups but you cannot remove the Default group however, you can modify it. If you want to use the Default group for testing your scheduled database backups, change the Autostart attribute to Enabled.

For details about how to configure a NetWorker backup group, refer to the *Legato NetWorker Administrator's Guide*.

Important: A scheduled backup will not occur if you do *not* enable the Autostart attribute in the backup group.

Task 4: Back Up Databases and Tablespaces

Before you can successfully complete a backup of a database or table space, you must have configured a Client resource for each client that you would like to be backed up to the NetWorker server.

To complete the Client resource configuration for scheduled backups, see "Task 2: Create a Client Resource" on page 22.

Use the following examples to back up databases and table spaces depending on your configuration:

How to Backup a Database

To back up a database, follow *DB2:/* with a database name:

DB2:/*SAMPLE*

/SAMPLE is the name of the database to be backed up.

Running a scheduled backup with this save set name in the Client resource is the same as performing the following manual backup:

db2 backup db *SAMPLE* **load usr/lib/libnsrdb2**

How to Backup Multiple Databases

To run a full database backup of the database *TEST* and a multiple table space backup of the database *SAMPLE*:

- **DB2:/***TEST*
- **DB2:/***SAMPLE/USERSPACE1/USERSPACE2*

Important: Scheduling multiple backups of the same database, at the same time will fail. You should only have one save set name per database in the *Save set* list.

On Windows, you should only have one line in the saveset list that specifies a database or a table space backup.

How to Backup a Table Space

To run a table space backup, place the tablespace name after the database name and separate them with a slash:

DB2:*/SAMPLE/USERSPACE1*

USERSPACE1 is the name of the table space of the database *SAMPLE*.

A scheduled backup with the save set name in the Client resource is the same as performing the following manual backup:

db2 backup db *SAMPLE tablespace (USERSPACE1)* **load \ usr/lib/libnsrdb2**

How to Backup Multiple Tablespaces

To back up table spaces *USERSPACE1* and *USERSPACE2* of database *SAMPLE*:

DB2:*/SAMPLE/USERSPACE1/USERSPACE2*

The two table space backups running together is the same as performing the following manual backup:

db2 backup db *SAMPLE tablespace (USERSPACE1,USERSPACE2)* **\ load usr/lib/libnsrdb2**

Task 5: Test Scheduled Backup Configuration

When you have finished configuring a scheduled backup for a DB2 Universal Database instance, run a test backup manually using the NetWorker Administrator program.

Before you run the test, make sure that:

- The required environment variables are set in the **nsrdb2** script
- The required environment variables are set in the database vendor configuration file
- The database engine is stopped and restarted for the changes in the vendor configuration file to take effect
- The pre and post-processing scripts are in place (optional)

To run a test scheduled backup after creating the Client resource:

1. Log in to the computer as root on UNIX or administrator on Windows.
2. Display the NetWorker Administrator program.

3. Open the Group Control window:
   - On UNIX- Select Server>Group Control
   - On Windows- Open Groups in the Group Control window
4. Highlight the correct Group name for the scheduled backup.
5. Start the backup.
6. When the Status of the selected group changes to Finished, the backup is complete. An e-mail notification will provide a report of the scheduled backup.

Using Multiple Session Backup

NetWorker Module 1.5 supports the use of multiple sessions for the backup of DB2 Universal Database. Multiple sessions are one or more streams of data that can be extracted, in parallel, from a database, and written in parallel to multiple media devices. With NetWorker Module, multiple sessions can enhance performance significantly when a large amount of data is backed up and restored using multiple tape drives. The number of sessions to be used is specified by the *OPEN num-sess SESSIONS* parameter of the database backup command.

Important: Before you start a multiple session backup, ensure that the number of devices is the same as the number of sessions specified in the backup command. Target sessions for each device must be set to a value of 1 for optimal restore performance.

For information about configuring multiple session backups, see "Using Multiple Session Backup" on page 31.

Monitoring Scheduled Backups

You can monitor scheduled backups the same way you monitor manual backups.

You can monitor messages that appear in the Group Control window of the NetWorker Administrator GUI and review the report generated when the scheduled backup is complete. For more details, refer to the *Legato NetWorker Administrator's Guide* appropriate for your platform.

Diagnostic and Error Messages

If a scheduled backup fails, you will receive error messages and debugging information. To obtain more details:

1. Select Server>Group Control>Details.
2. View the *savegrp.log* file in the NetWorker *logs* directory:
   - On UNIX:
     /nsr/logs/savegrp.log
   - On Windows:
     – With NetWorker 5.5.x:
     %System Root%\win32app\nsr\logs\savegrp.log
     – With NetWorker 5.7 and later:
     %System Root%\Program Files\nsr\logs\savegrp.log

Chapter 5: Restoring Data

This chapter provides details about setting up and running DB2 Universal Database data restore operations. NetWorker Module enables you to run restores using the command line interface.

This chapter also describes the basic procedures for restoring the database to a consistent state. See "Performing a Restore Operation" on page 54 for different disaster recovery scenarios, and information about preparing for disaster recovery.

This chapter contains the following sections:

Restoring Data

You can only restore database data that has been backed up according to the instructions in "Chapter 3: Manual Backups" on page 29 or "Chapter 4: Scheduled Backups" on page 37.

During a database backup, the NetWorker server adds entries for the backup to the online client index and media index files. These entries provide information needed for restoring any database data:

- NetWorker software adds client information about the specific data backed up to the client.
- NetWorker software adds information about the location of each backup volume and the data written to the volume to the media index.

  The NetWorker Client resource configured for the database computer includes a browse policy and retention policy. A client index entry is maintained until the time period specified by the browse policy has been exceeded.A media index entry is maintained until the time period specified by the retention policy has been exceeded.

  When the browse and retention policies for all the savesets on a backup volume have been exceeded, the volume becomes recyclable and eligible for automatic relabeling by the NetWorker software. The data on the volume can no longer be restored.

Important: You must always restore database data using the database command line interface. You *cannot* use the NetWorker client and server command line and GUI interfaces to perform a restore operation.

How to Configure a Restore Operation

NetWorker Module performs restores of database data based on NetWorker XBSA environment variables.

1. Set variables in the DB2 Universal Database vendor configuration file.

For more information about the vendor configuration file, see the Chapter 2 section "Task 1: Configure the DB2 Universal Database Instance" on page 20.

2. Set the *NSR_SERVER* environment variable to the name of the NetWorker server that contains the backup you want to restore.
3. Set the Remote Access field to the host on which you are restoring data, if required.

Important: To restore a backup of a DB2 Universal Database computer to a different computer, add the fully qualified domain name of that computer to the *Remote access* field in the NetWorker Client resource.

To set other NetWorker XBSA environment variables. For more information, see "Appendix A: XBSA Environment Variables" on page 61.

4. Use the **taken at date-time** option to specify which backup you want to restore if you have full database backups and table space backups on the NetWorker server.
   - If you do not use the **taken at date-time** option, the database manager cannot distinguish between backups. The **db2 restore** command will generate error messages.
   - If you did not save the timestamp at the time of the back up, you can use the **db2** command to query all backups:

     `$ db2 list history backup all for` *SAMPLE*

   Table 3 lists the path and the suffix information for **libnsrdb2**.

Table 3. Path and Suffix for libnsrdb2.*

Operating System	Path with Sufffix
AIX	**/usr/lib/libnsrdb2.a**
HP-UX	**/usr/lib/libnsrdb2.sl**
Linux	**/usr/lib/libnsrdb2.so**
Solaris	**/usr/lib/libnsrdb2.so**
Windows NT and Windows 2000	• NetWorker release 5.5.4 and earlier: **<drive>:\win32app\nsr\bin\libnsrdb2.dll** • NetWorker release 5.7 and later: **<drive>:\Program Files\nsr\bin\libnsrdb2.dll**

5. Perform a restore using the **db2 restore** command. For example:

   $ **db2 restore db** *SAMPLE* **load /usr/lib/libnsrdb2**

   - For the correct **libnsrdb2** file extension according to your platform, see Table 3, "Path and Suffix for libnsrdb2.*," on page 53.
   - For the correct syntax of the **db2 restore** command, refer to the *DB2 Universal Database Command Reference*. This command restores the most recent database backup on the NetWorker server.

     For more details about the **db2 restore** command, refer to the *DB2 Universal Database Administrator's Guide: Design and Implementation*.

Performing a Restore Operation

You can restore a database or table space to a particular point in time:

- If your database is enabled for roll-forward restore (setting the *LOGRETAIN* or the *USEREXIT* database configuration parameter.)
- If you created log backups. For details see, "Back Up Log Files" on page 31.

How to Perform a Roll-Forward Restore

To perform a roll forward restore:

1. Restore the database. For details see, "Performing a Restore Operation" on page 54.
2. Roll forward changes in a database or table space using the **db2 rollforward** command. The following **db2 rollforward** command restores all the logs that were created after the database backup and re-applies the transactions:

   $ **db2 rollforward db** *SAMPLE* **to end of logs and complete**

   When you issue the **db2 rollforward** command, the database manager calls the **db2uext2** program (provided with NetWorker Module). The **db2uext2** program restores the required logs, and re-applies the transactions recorded in the logs to the restored database. For more information about the **db2 rollforward** command, refer to the *DB2 Universal Database Administrator's Guide: Design and Implementation*.

How to Perform a Manual Roll-Forward Restore

If you are performing a rollforward restore to a database with a different name or you have changed the *Path to log files* database configuration parameter, you must:

- Restore the logs.
- Roll-forward changes in the database manually.

  The logs are stored on the NetWorker server as XBSA objects with a database name and a log path directory attribute. If a database name or log path directory has changed since the time of the backup, the DB2 Universal Database manager will not be able to find the logs during the rollforward restore.

  Note: The **into target-database-alias** option of the **db2 restore** command is used to change the database name.

To restore the logs and roll forward changes in the database manually:

1. Restore the database. For details see, "Performing a Restore Operation" on page 54.
2. Change your working directory to the directory specified by the `Path to log files` database configuration parameter.
3. Set the necessary NetWorker XBSA environment variables.
   a. Set the variables in your shell and *not* in the DB2 Universal Database vendor configuration file, since you are restoring the logs manually.
   b. Set the *NSR_SERVER* environment variable to the name of the NetWorker server containing the backup.
4. If you are restoring to a different host than where the backup was taken, set the *NSR_CLIENT* environment variable on the new host to the NetWorker client where the backup was taken.

   For a description of other NetWorker XBSA environment variables, see "Appendix A: XBSA Environment Variables" on page 61.
5. Issue the **db2 rollforward** command with the **query status** option to find out the first log file to be read. For example:

   $ **db2 rollforward db** *SAMPLE* **query status**
6. Run the **db2uext2** command. An example on Solaris is:

```
$ db2uext2 -OSSolaris -RLSQL07010 -RQRETRIEVE -DBSAMPLE\
-NNNODE0000 -LP/home/db2inst1/db2inst1/NODE0000/\
SQL00001/SQLOGDIR/ -LNS0000001.LOG
```

The options used with this sample **db2uext2** command are described in Table 4.

Table 4. db2uext2 Command Example

Command Option	Description
-OSAIX	The operating system is **AIX**.
-OSHP	The operating system is **HP-UX**
-OSLinux	The operating system is **Linux**
-OSNT	The operating system is **Windows NT** or **Windows 2000**
-OSSolaris	The operating system is **Solaris**.
-RLSQL07010	The DB2 Universal Database version is **SQL07010**.
-RQRETRIEVE	The action to perform is **RETRIEVE**.
-DBSAMPLE	The name of the database (all uppercase letters) the log belonged to during the time of the backup is **SAMPLE**.
-NNNODE0000	The node number is **NODE0000**.
-LP/home/db2inst1/db2inst1/NODE0000/SQL00001/SQLOGDIR/	The absolute path of the database log path directory from which the log was backed up is specified after **-LP**.
-LNS0000001.LOG	The name of the log you want to restore is **S0000001.LOG**.

7. Restore all the logs by running **db2uext2** for each log you need to restore. Use the appropriate options with each **db2uext2** command, as described in Table 4.
8. Reapply the transactions in the logs to the database by issuing the **db2 rollforward** command. For example:

   $ **db2 rollforward db** *SAMPLE* **to end of logs and stop**

Refer to *DB2 Universal Database Administration Guide* and the *DB2 Command Reference* for detailed information about the **db2 rollforward** command.

You might want to:

a. Roll forward the transactions in the logs one by one.
b. Restore the logs using the **db2uext2** program.

9. Roll forward the changes in the log by using the **db2 rollforward** command without a **stop** or **complete** option.

   If you have a lot of large log files, you might want to roll forward the transactions in the logs one by one:

   a. Restore the log files using the **db2uext2** program.
   b. Roll forward the changes in the log by using the **db2 rollforward** command without a **stop** or **complete** option.

   If you are doing a database roll-forward to a point in time, examine the output from the **db2 rollforward** command to see if you have reached that point in time .

   c. If you have reached that point in time, issue **db2 rollforward** with a **stop** or **complete** option to bring the database into a consistent state.
   d. If you have not reached that point in time, continue restoring and applying transactions in the logs.
   e. If you run **db2uext2** with a log name and such a log is not restored, the backup of the specified log does not exist on the NetWorker server and you will have to issue **db2 rollforward** with a **stop** or **complete** option to bring the database into a consistent state.

Multiple Transactional Log Sequences

If you restore a database enabled for rollforward restore without using roll forward, you will create multiple transactional log sequences. This happens because log names are reused. For more information about how the database instance manages logs, refer to *DB2 Universal Database Administration Guide*.

With the **db2uext2** program provided with DB2 Universal Database you can only restore the most recent sequence of transactional logs.

In some circumstances, you might need to restore your database to a different computer from the one where it was originally backed up.

How to Perform a Redirected Restore

You can perform a redirected restore using one of the following configurations:

- to the same instance
- to another instance

To restore your database to the same instance on a secondary computer, perform the following steps on the secondary computer where you will be restoring the data:

1. Install and configure NetWorker Module on the secondary computer where you will be restoring the data.
2. In the vendor configuration file, set the *NSR_SERVER* environment variable to specify the name of the new NetWorker server.
3. In the vendor configuration file, set the *NSR_CLIENT* environment variable to either the name of the NetWorker client that was backed up or the value of *NSR_CLIENT* used during the backup.
4. To restore backups to a different computer, you must add the fully qualified domain name of that computer to the Remote access field in the NetWorker Client resource configured for the host.

To restore the database to another instance on a secondary computer, you must perform the following additional steps.

1. Set the Application Information field in the Client resource:
   a. Add the name of one or more database instances that require restore permission on the same or different host in the Application Information field.

      Note: When you enter the following command, make sure that you insert a colon after the last instance.

      The command **DB2_R=***SAMPLE:db2inst1:db2inst2:* allows the instances *db2inst1*and *db2inst2* to restore the database *SAMPLE*.

      Instances are always separated by a colon after the database name.

   b. Add another line in the Application Information field for any other databases that you want to add to a Client resource. For example:

      DB2_R=*SAMPLE:db2inst1:db2inst2:*

      DB2_R=*TEST:db2inst3:db2inst4:*
2. Run the **db2 restore** command with the appropriate options to restore the database.

   For more information, see "Performing a Restore Operation" on page 54.

Using Multiple Session Backup and Restore

NetWorker Module 1.5 supports the use of multiple sessions for the backup and restore of DB2 Universal Database. Multiple sessions are one or more streams of data that can be extracted, in parallel, from a database, and written in parallel to multiple media devices. With NetWorker Module, multiple sessions can enhance performance significantly when a large amount of data is backed up and restored using multiple tape drives. The number of sessions to be used is specified by the *OPEN num-sess SESSIONS* parameter of the database back up command.

How to Improve Performance for Multiple Session Restores

Before starting a multiple session restore ensure that you have properly configured a multiple session backup. For detailed instructions, see "Using Multiple Session Backup" on page 31.

Important: Before you start a multiple session restore, ensure that the number of devices is the same as the number of sessions specified in the restore command. Target sessions for each device must be set to a value of 1 for optimal restore performance.

To improve multiple session restore performance:

1. Start the NetWorker Administrator program.
2. Specify a separate device for each session in the restore operation.

   For optimum performance, ensure that the same number of devices are available at restore time as were used during the backup. Use the **nsrinfo** command to find the number of sessions that were run during the backup:

   # **nsrinfo -s** *server* **-n** *database* **-X all** *clientname* **|grep** *db_name*

   The following is sample output from the **nsrinfo** command:

   ```
   # nsrinfo -s tundro.legato.com -n db2 -X all \
   tundro.legato.com | grep DEMODB

   version=1, objectowner= DB2, objectname=/DEMODB/NODE0001
   /FULL_BACKUP.20011017164756.1, createtime=Wed Oct 17
   16:47:56 2001, copytype=BSACopyType_BACKUP, copyId=10033

   51676.1003351677, restoreOrder=1003351676.1,lgname=,
   copygpname=, objectsize=0.0, resourcetype=database,
   objecttype=BSAObjectType_FILE,

   objectstatus=BSAObjectStatus_

   ACTIVE, description=DB2 Backup, objectinfo=db2inst1:1
   ```

   Note: The *objectinfo=db2inst1:1* output is the information that is required to proceed with the multiple session restore. *db2inst1:* is the instance that did the backup and `1` is the number of sessions that were used for the backup.

Appendix A: XBSA Environment Variables

This appendix lists the XBSA environment variables and describes how to set them in the vendor configuration file. For more information, see:

- "XBSA" on page 61
- "Setting XBSA Variables" on page 69

XBSA

XBSA allows for the configuration of environment options to activate certain features of NetWorker not directly supported by X/Open specifications. XBSA enables a DB2 Universal Database instance and NetWorker to interact during backups and restores.

This section lists the XBSA environment variables, their default values, and valid options:

Note: When you set the *NSR_DB2UEXT2_ARCHIVEPATH* and the *NSR_DB2UEXT2_RESTOREPATH* environment variables in the vendor configuration file, ensure that you *always* include a slash at the end of the path.

NSR_CLIENT

Definition	The *NSR_CLIENT* environment variable indicates the NetWorker client resource to use for the XBSA session.
Default Value	Host from which the XBSA session is initiated, as indicated by **getlocalhost()**.
Possible Values	NetWorker client resource name. Since the client name is an arbitrary string, the value for *NSR_CLIENT* is not checked directly. An incorrect value may cause an authentication or system error in NetWorker.

NSR_COMPRESSION

Definition	The *NSR_COMPRESSION* environment variable indicates whether to compress the backup data as it is sent to the NetWorker server.
Default Value	**FALSE**
Possible Values	**TRUE** Setting *NSR_COMPRESSION* to a value of *TRUE* means the standard compression technique for XBSA for NetWorker is performed on the data backed up. *FALSE* Setting *NSR_COMPRESSION* to a value of *FALSE* means that compression is not performed. *Note:* Compressing data from the database server may speed up backups, as long as the database server is able to send data to the backup server fast enough to keep the tape drive streaming. Data compression during backup will impact CPU usage on the computer that the DB2 Universal Database resides, and will reduce the amount of data sent to the NetWorker server.

NSR_DATA_VOLUME_POOL

Definition	The *NSR_DATA_VOLUME_POOL* environment variable indicates the volume pool to which data files should be backed up.
Default Value	XBSA does not set a pool by default. If not specified, the pool is selected by the NetWorker server based on its pool resources configuration.
Possible Values	Any valid NetWorker pool name.

NSR_DB2UEXT2_ARCHIVEPATH

Definition	The *NSR_DB2UEXT2_ARCHIVEPATH* environment variable indicates where the DB2 logfiles will be archived to when *NSR_DB2UEXT2_DEV=DISK*.
Default Value	Log archive directory.
Possible Values	Setting *NSR_DB2UEXT2_ARCHIVEPATH* to any valid path to specify where the logfiles will be archived to.

NSR_DB2UEXT2_DEBUG_FILE

Definition	The *NSR_DB2UEXT2_DEBUG_FILE* environment variable indicates the full pathname of a log file to which diagnostic and error messages specific to DB2 Universal Database transactional log backup and restore should be written to. If this variable is not set, the log file will not be created.
Default Value	None.
Possible Values	Any valid pathname.

NSR_DB2UEXT2_DEV

Definition	The *NSR_DB2UEXT2_DEV* environment variable indicates where the DB2 logfiles will be written to and read from.
Default Value	*NSR*
Possible Values	Setting *NSR_DB2UEXT2_DEV* to a value of *NSR, DISK* specifies where the logfiles are written to and read from.

NSR_DB2UEXT2_RESTOREPATH

Definition	The *NSR_DB2UEXT2_RESTOREPATH* environment variable indicates where the DB2 logfiles will be restored from when *NSR_DB2UEXT2_DEV=DISK*.
Default Value	*NSR_DB2UEXT2_ARCHIVEPATH*
Possible Values	Setting *NSR_DB2UEXT2_RESTOREPATH* to the same value as *DB2UEXT2_ARCHIVEPATH*, the log restore directory or any other valid path will specify where the logfiles will be restored from.

NSR_DEBUG_FILE

Definition	The *NSR_DEBUG_FILE* environment variable indicates the full pathname and filename to which XBSA messages should be written. Message logs for XBSA are separated from regular NetWorker messages.
Default Value	Set the *NSR_DEBUG_FILE* variable to the pathname of the file where NetWorker XBSA messages should be written, the default value will be: • On UNIX *$INSTHOME/sqllib/log/nsrdebug.log* • On Windows *$INSTHOME\sqllib\logging\nsrdebug.log* *$INSTHOME* is where DB2 Universal Database is installed.
Possible Values	Any valid pathname or filename. If the file specified cannot be opened, a *BSA_RC_INVALID_KEYWORD* error message is written to the default file.

NSR_DEBUG_LEVEL

Definition	The *NSR_DEBUG_LEVEL* environment variable indicates the level of debugging to use during the NetWorker backup and recover sessions for *NSR_DEBUG_FILE*.
Default Value	The default value is 2, which means that critical error messages and all network (RPC) errors are written.
Possible Values	• **0**, no debugging information • **1**, only errors causing fatal system errors • **2**, all network related errors • **3**, messages concerning the operation taking place • **4**, all starting and ending of sessions • **5**, parameters for all entries and exits from NetWorker • **6**, all entries and exits from internal NetWorker functions • **7**, all NetWorker internal errors • **8**, all NetWorker parameters

NSR_GROUP

Definition	The *NSR_GROUP* environment variable indicates the group configuration to use for a backup session.
Default Value	None
Possible Values	Any valid NetWorker group name of 1024 characters or less. Invalid group names may cause authentication or system errors in another routine.

NSR_LIBNSRDB2_DEBUG_FILE

Definition	The *NSR_ LIBNSRDB2_DEBUG_FILE* environment variable indicates a file that contains additional debug backup and restore information.
Default Value	No default value
Possible Values	Setting *NSR_ LIBNSRDB2_DEBUG_FILE* to a value of *path/filename* writes the log file to any valid path.

NSR_LOG_VOLUME_POOL

Definition	The *NSR_LOG_VOLUME_POOL* environment variable indicates the volume pool to which transactional logs should be backed up.
Default Value	XBSA does not set a pool by default. If not specified, the pool is selected by the NetWorker server based on its pool resources configuration.
Possible Values	Any valid NetWorker pool name.

NSR_NO_BUSY_ERRORS

Definition	The *NSR_NO_BUSY_ERRORS* environment variable indicates whether the savegroup should wait for a busy NetWorker server or fail immediately.
Default Value	*FALSE*. Wait for the NetWorker server to accept the connection.
Possible Values	Setting *NSR_NO_BUSY_ERRORS* to a value of *TRUE* causes the backup to fail immediately when the NetWorker server is busy. A network error message describing the reason for the failure is written to *xbsa.messages*.

NSR_SERVER

Definition	The *NSR_SERVER* environment variable indicates the *hostname* of the server that XBSA should use for a save session.
Default Value	The most appropriate server, based on the index name and client name for the session. *See also NSR_CLIENT*.
Possible Values	The server name defined by the NSR_SERVER environment variable is checked using **gethostbyname**(). If this routine call fails, the XBSA error code `BSA_RC_INVALID_KEYWORD` is returned.

Setting XBSA Variables

Set the XBSA environment variables in the DB2 Universal Database vendor configuration file to the required values. Do not include environment variables in the vendor configuration file that are not listed in this appendix.

Important: For a DB2 instance to recognize a change in the environment, stop and restart the database instance using the **db2stop** and **db2start** commands.

Note: For EEE configuration; if the instance directory is shared between multiple computers, the vendor configuration file will be the same for all nodes. Ensure that *only* variables common to all nodes are referenced in the vendor configuration file.

For more details about the vendor configuration file see "Task 1: Configure the DB2 Universal Database Instance" on page 20 of this guide.

A

Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to Legato NetWorker Module for DB2 Universal Database products.

administrators group	Windows NT user group whose members have all the rights and abilities of users in other groups, plus the ability to create and manage all the users and groups in the domain. Only members of the Administrators group can modify Windows NT OS files, maintain the built-in groups, and grant additional rights to groups.
API	An acronym for Application Program Interface, an agreed-upon set of computer library routines.
autochanger	A mechanism that uses a robotic arm to move media among various components located in a device including slots, media drives, media access ports, and transports. Autochangers automate media loading and mounting functions during backups and recovers.
browse policy	The policy that determines how long entries for your files remain in the online file index.
bootstrap	Information that includes the server index, media index, and configuration files needed for recovering NetWorker after a disk crash.
client	A computer that accesses the NetWorker server to back up or recover files. Clients may be workstations, PCs, or fileservers.
command line	The shell prompt, where you enter commands.

DB2 Universal Database	DB2 Universal Database, considered by NetWorker as one or more instances of a DB2 *database manager*.
database instance	A logical database server environment.
database manager	Database Instance Management System.
device	The backup device (tape drive, optical drive, or autochanger) connected to the NetWorker server; used for backing up and recovering client files.
enabler codes	Special codes provided by Legato that allow you to run your NetWorker software product.
file index	A database of information maintained by NetWorker that tracks every file or filesystem backed up.
full (f)	A backup level in which all files are backed up, regardless of when they last changed.
group	A client or group of clients that starts backing up its files at a designated time.
log	See "transactional log".
multiple session backup and restore	A method of backing up or restoring multiple streams of data simultaneously.
recycle	A volume whose data has passed both its browse and retention policies and is available for relabeling.
retention policy	A NetWorker policy that determines how long entries will be retained in the media database and thus be recoverable.
roll forward	Applies transactions recorded in the database log files.
save set	A set of files or a filesystem backed up onto backup media using NetWorker.
save set ID	An internal identification number assigned to a save set by NetWorker.

skip	A back up level in which files are skipped and *not* backed up.
storage manager	An application that manages the storage devices and media used for DB2-Backup backup and restore requests. DB2 Universal Database is a storage manager that connects NetWorker to DB2-Backup through XBSA.
volume ID	The internal identification assigned to a backup volume by NetWorker.
volume name	The name you assign to a backup volume when it is labeled.
volume pool	A feature that allows you to sort backup data to selected volumes. A volume pool contains a collection of backup volumes to which specific data has been backed up.
table space	A storage model that allows you to assign the location of a database and table data directly to a container, such as a directory name, device name, or file name.
transactional log	A record of DB2 Universal Database database transactions, stored in a log file to execute fast restore and roll back transactions.
XBSA	An acronym for X/Open® Backup Services Application Programming Interface, which connects NetWorker functionality to DB2-Backup. For more information about X/Open, visit the X/Open website at *www.xopen.org*.

Index

Index

F

L

M

N

R

S

T

U

V

W